

So... How Is Climate Affecting *West Nile Virus* this Year?

It depends on whom you ask.

Some say that this year's warmer winter temperatures may have allowed increased survival of the mosquitoes involved in transmitting the virus, resulting in higher mosquito populations earlier in the year. Others say that the warmer temperatures actually reduce survival as the mosquitos use their reserve fat stores more quickly. Still others say that the prolonged dry conditions experienced this year limit the available aquatic breeding habitats and lower the humidity required for adult mosquito survival, which would result in fewer mosquitos available and later onset of virus transmission.

One thing is clear, however, the West Nile Virus transmission cycle is a complicated interaction involving the virus, approximately 22 species of primary and secondary mosquito vectors, at least 103 species of birds, horses, other animals, and humans. (Fig. 1) The nature of these interactions is complex, and the role of climate in disease onset, spread, and control is not well understood. However, understanding the nature of this interaction is one of our best opportunities to provide early warning of climate-related risk to help manage the disease and stem its spread.

West Nile Virus falls into the category of flaviviruses, such as St. Louis Encephalitis and Western Equine Encephalitis. Scientists speculate that these virus types are expanding throughout the world because of warmer winters, changes in ecosystem dynamics, and increased human population and commerce. Changes in temperature and precipitation related to climate variability are thought to affect transmission in different ways:

- Longer summer seasons could expand the transmission season by supporting faster mosquito population growth and virus development and transmission.
- Warmer winter temperatures could enhance the survival of certain mosquito species.
- Wetter conditions can expand aquatic breeding habitats.
- Drier conditions can allow pooling of water, particularly in urban environments, increasing mosquito populations.

Vulnerability

What were the set of conditions that allowed West Nile Virus to move into the United States in 1999? Did something make us uniquely vulnerable that year? Did climate play a role? While it may not be the main driver, climate may be one of the conditions that allowed the virus to appear and become established.

Now that West Nile Virus is here (Fig. 2), how will it spread? Some of the basic information can be modeled to help determine the key variables driving the system. This could aid in surveillance efforts and resource allocation.

Scientists are unclear to what extent prolonged drought, onset and intensity of rainfall, and diurnal temperature fluctuations affect seasonal disease transmission. For example, research has shown that the amount, location and quality of water available for mosquitos are important. As a result, NOAA and its partners are working with public health officials and researchers to develop a "ponding index" for use in mosquito control. In addition, a frost forecast this fall could help public health officials determine pesticide use and its appropriate application.

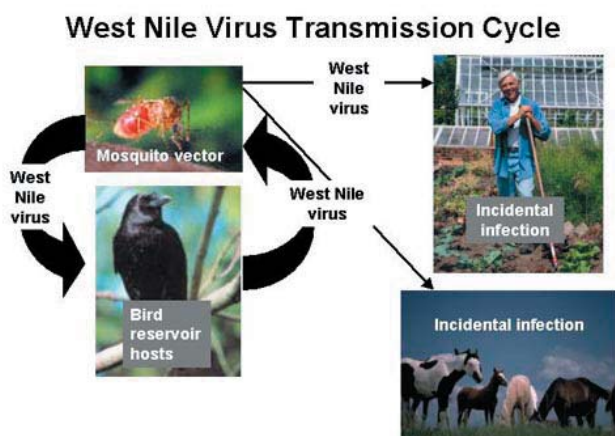


Figure 1: Source: Centers for Disease Control and Prevention

Changing Times

A National Academy of Sciences Report on Public Health Systems and Emerging Infections, published in 2000, recommended that the public health community:

“Increase the use of novel surveillance systems and modeling techniques to help predict, detect, or monitor disease trends, environmental and climatic conditions or genetic shifts that suggest disease outbreaks and facilitate epidemiological investigations.”

a sustained and systematic interaction among many disciplines, including public health, ecology, climate, social science, and with many agencies at the federal, state, or local level.

It's not enough to say we have climate information, or that an El Niño is coming. We need to work across communities to figure what that really means in public health terms. This requires integrated research, intellectual rigor, institutional evolution, solid partnerships, and the political will to support this shift.

We have a tremendous opportunity to bring not just useful climate information, but a whole new approach, to bear on important public health issues, such as managing West Nile Virus.

Using climate information for public health decisions requires

West Nile Virus in the United States, 1999-2001

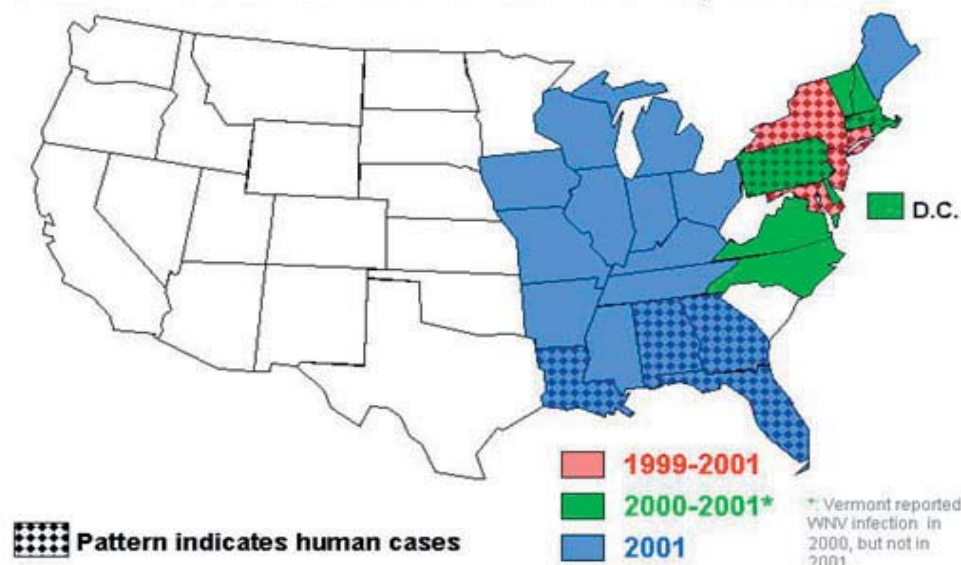


Figure 2: States reporting confirmed West Nile virus infection in birds, mosquitoes, animals, or humans from 1999 to 2001. Source- Centers for Disease Control and Prevention

Note: NOAA works closely with its partner agencies and private sector institutions, NSF, EPA, NASA, and EPRI through the Climate Variability and Health Program to address this and other climate-health issues.

For additional information, please contact:

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